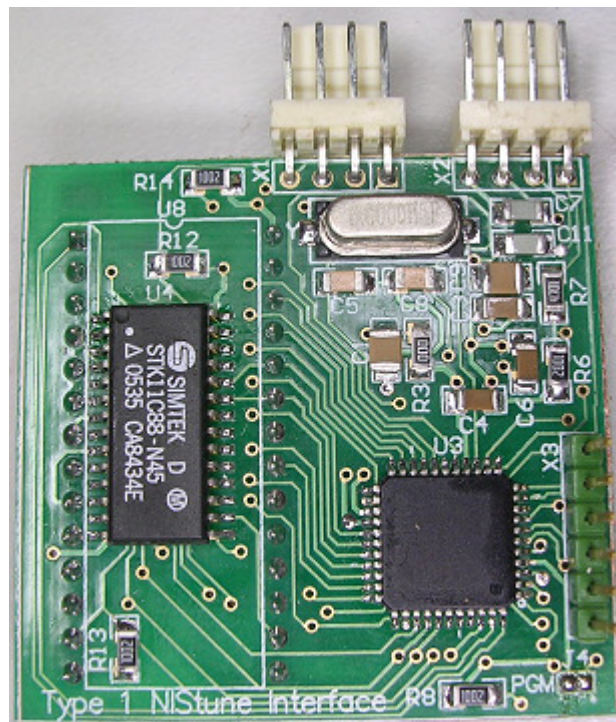




TYPE#1



6802/6303 USB Consult Hardware Installation Manual V3.2 Type 1 - Rev3A/3B / 4 Boards

(JECS ECCS 1984-1989 Legacy Engine Control Units,
HITACHI ECCS/NICS 1985-1989 Legacy Engine Control Units)

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INTRODUCTION

Welcome to NIStune.

The NIStune hardware and software solution provides a means for the car enthusiast to retune their vehicle whilst retaining their factory ECU and its default programming.

This solution provides many advantages over aftermarket ECUs in that the

- Factory default tuning is maintained once the NIStune board is installed. Upon installation of the board, vehicle will be operational as usual.
- Additional tuning can then be made against the factory maps for modifications made to the vehicle. There is no need to tune the car to get it running from scratch, reducing time and costs of tuning required on dyno.
- There is no need for wiring loom modifications.

NIStune provides realtime tuning and maptracing. It provides the ability to make changes on the fly to the factory ECU and then the desired results are achieved, save these permanently in non-volatile memory on the programmable board.

NIStune also provides data logging and playback facilities, the first available for legacy type 1980s Nissan JECS/Hitachi ECUs. NIStune software also provides a user friendly responsive graphical interface to perform modifications.

Contained in this manual are the instructions for installing a NIStune board into 1980s Nissan vehicles.

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WARNING

If your ECU pulses the fuel pump, injectors, fuel regulator, flashes LEDs randomly (or they just stay on when they shouldn't) or your engine does not start then your ECU may not have your board fitted correctly.

Testing has shown on early Nissan ECUs that this can potentially keep the Mass Airflow Meter heater element on longer than 1 second and blow it like a fuse.

Check:

- **Poor connection between the NISTune board and ECU due to failure to secure the board correctly using hot glue or similar mechanism**
- **Poor header cable connection to the ECU from NISTune board**
- **Mismatched NISTune board configuration for the ECU image you are attempting to use**

How to fix this:

- **Always firstly try ECU with the factory ROM without the NISTune board to attempt to start the car properly**
- **Ensure your NISTune board has the correct base ROM image loaded for your ECU**
- **Ensure your solder joints are good and header connector is installed correctly**
- **Attempt USB Consult connection to the NISTune board to verify communication**

The NISTune diagnostics document covers problem diagnosis in more detail

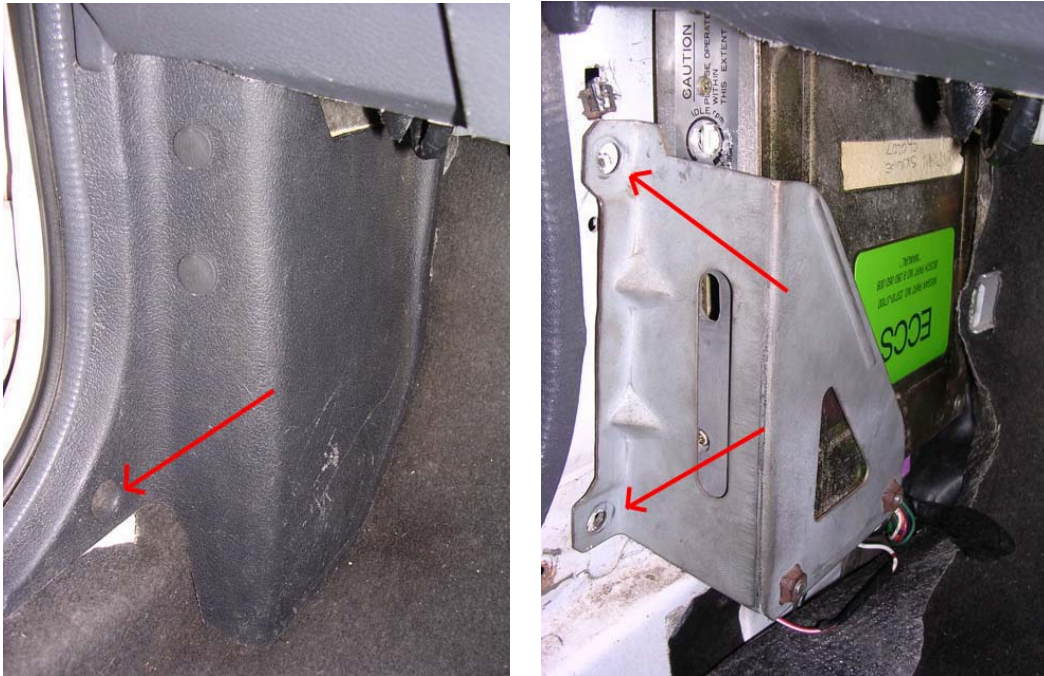
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1. Removing the ECU

Locate the ECU in vehicle to be modified. The location of the factory ECU can be identified from the vehicle service manual. The picture below shows the location of the ECU in the LHS passenger foot well of an R31 Skyline.

Disconnect your negative battery terminal prior to removing the ECU. Remove the screws holding in the mounting bracket. Then slide the ECU out from the kick panel and unplug the connectors.



Below is a picture of the ECU with the mounting bracket removed. If sending the ECU away for NISTune board installation, please send without the mounting bracket.



2. Opening the ECU

For NIS tune board installation, firstly remove the top and bottom lids from the ECU. Screws require a correctly matched Philips head screw driver as they are usually fitted from factory with a red or blue epoxy which requires some force in order to remove the screws.



The following chapter is split into different sections, dependent on what ECU you have.

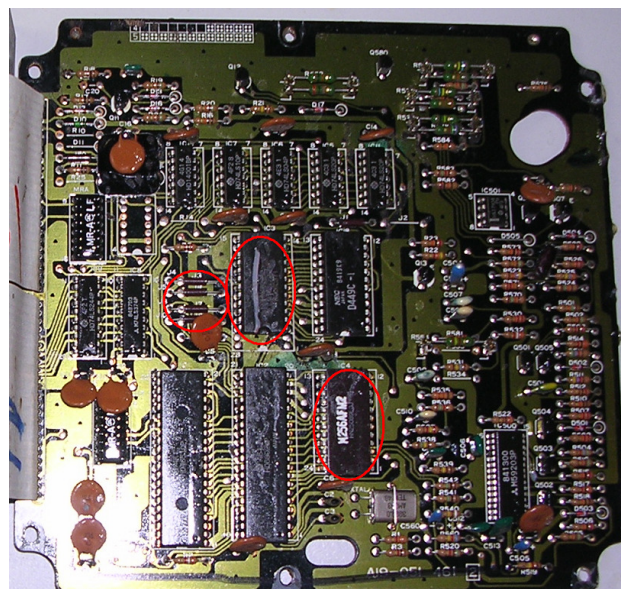
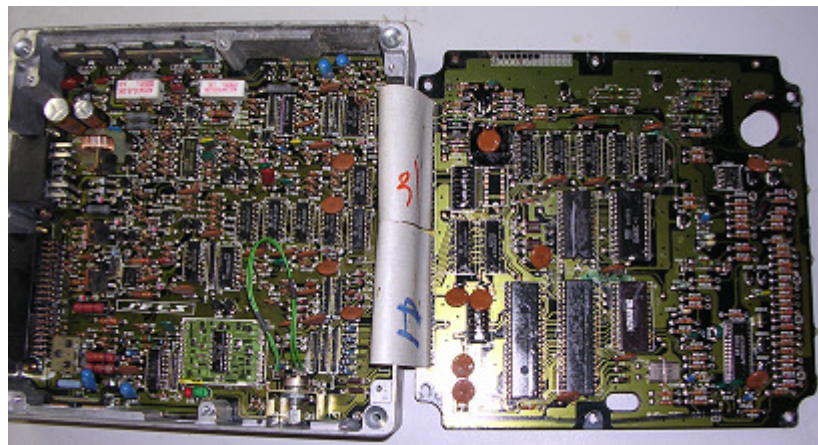
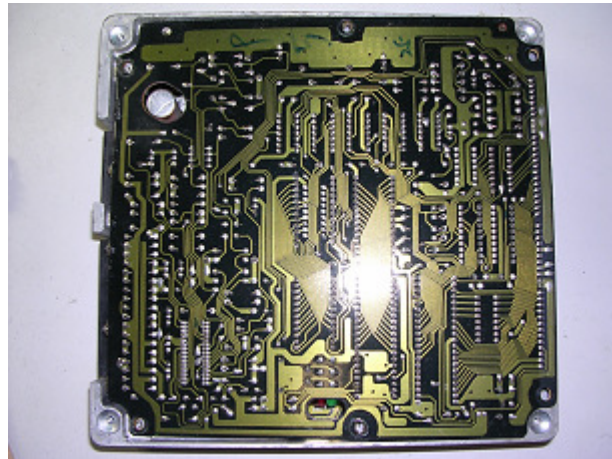
3. Resocketing the ECU

A. 1984-1985 Dual Board - Dual ROM ECUs

Vehicles: Early Z31 300ZX and E12 Nissan Exa.

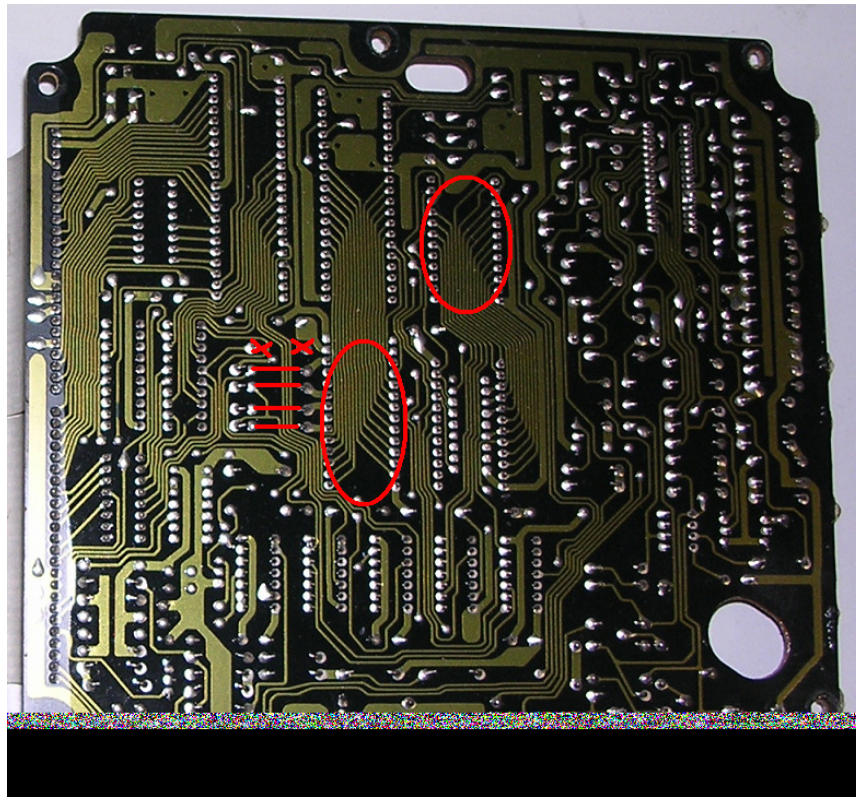
This is a multiboard ECU with a 1K and 8K ROM chip. The two chips need to be removed and jumpers changed on the board before the NISTune board can be installed.

The ROM images must be read using a special adaptor plugged into an EPROM programmer. These are then combined into a 16K image and converted into a NISTune ENT file for programming the board.

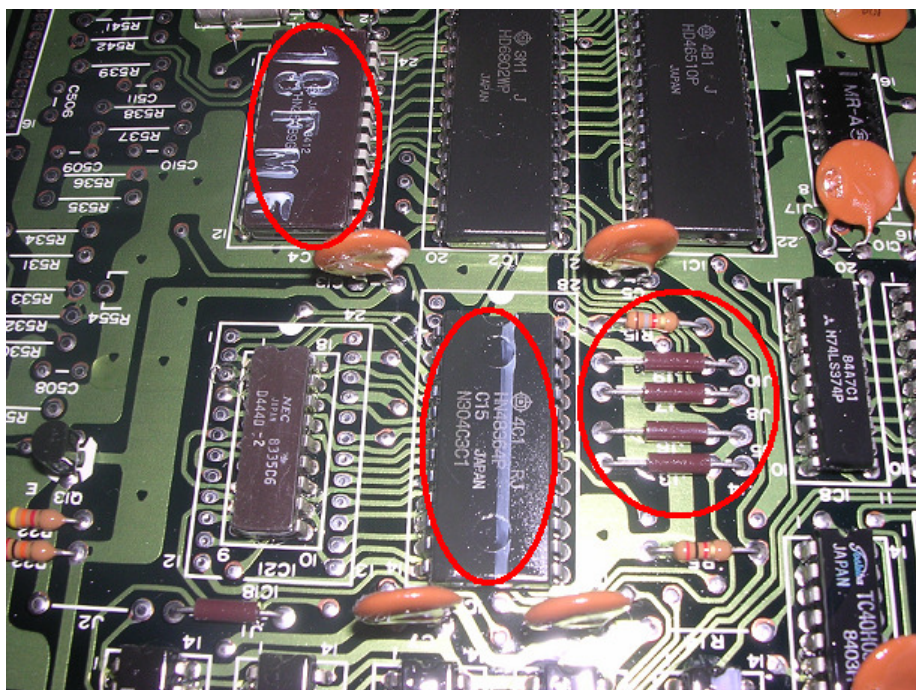


To remove the two ROM chips (U3 and U4) desolder from the top side of the ECU. Be **very careful** with the heat of the desoldering gun because the pads on these ECUs lift very easily. It doesn't take much to break a track on these earlier circuit boards.

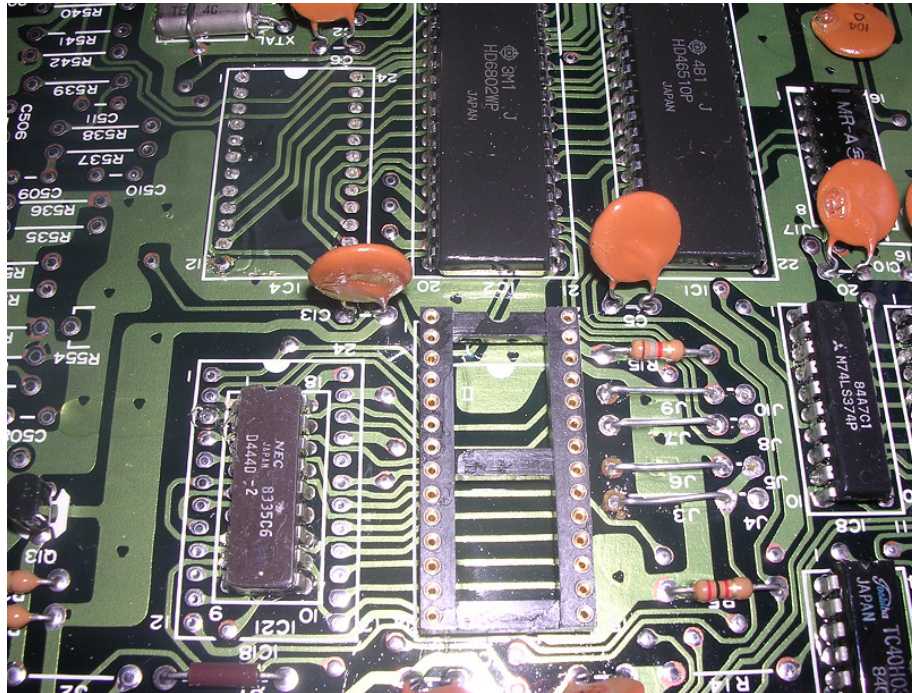
Insert the supplied IC socket in IC3 and solder in. Fill in the through holes if IC4 with solder.



Next remove the four brown jumpers. These are J4, J5, J8 and J10. You can shorten these existing jumpers positions to J3, J6, J7 and J9 by desoldering one end and repositioning it. Be careful when desoldering the track to ensure that it does not lift. These ECUs are very old and the circuit boards are fragile.



The below picture shows the removed ICs, installed 28 pin machine drilled socket and four wire link jumpers installed in their new locations.



Next remove R15 which is below J9/J10. This is no longer used with the NISTune board installed. Note that You will no longer be able to use the factory ROM chip in this ECU once these jumpers are changed.

Installation of the NISTune board now follows the same procedure as for other 6802 based ECUs.

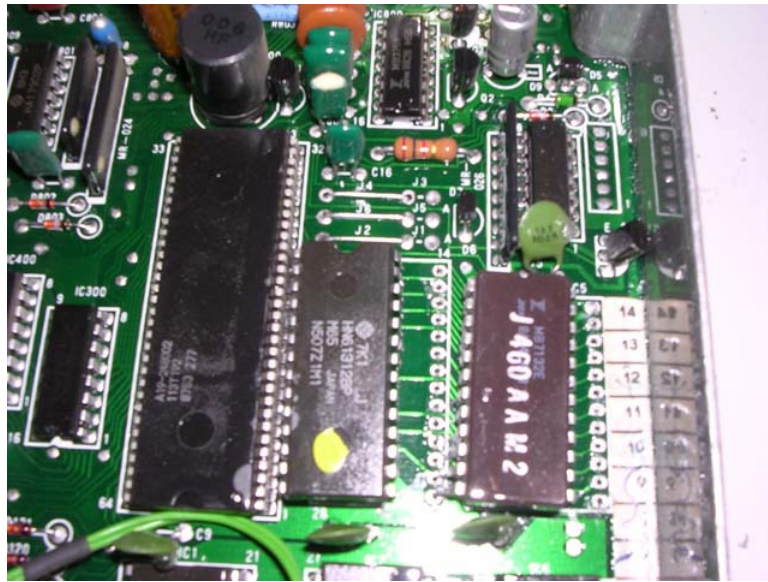
B. 1986 Single Board - Dual ROM ECUs

Vehicles: Z31 300ZX VG30 1986-1987, CR31 / VL / VLT RB30

Some 1986 era ECU have both a 28 pin ROM and 24 pin ROM chip. These are located next to each other. Not to be confused with the 24 pin RAM chip that is located next to the HD6802 processor.



1. Remove both of these ROM chips as seen below. The second smaller ROM actually overshadows the maps on the first ROM for ECUs so is not needed for normal ECU operation.



2. Where the 28 pin ROM has been removed, replace this with a 28 pin machine drilled socket. Fill in the throughholes where the 24 pin ROM was mounted with solder. Note the orientation of the socket must have the crescent indent facing the same direction of the previously installed ROM chip.

3. Use some holder to connect J4 to J3 as seen in the picture above. This will enable useage of only the 28 pin chip now.

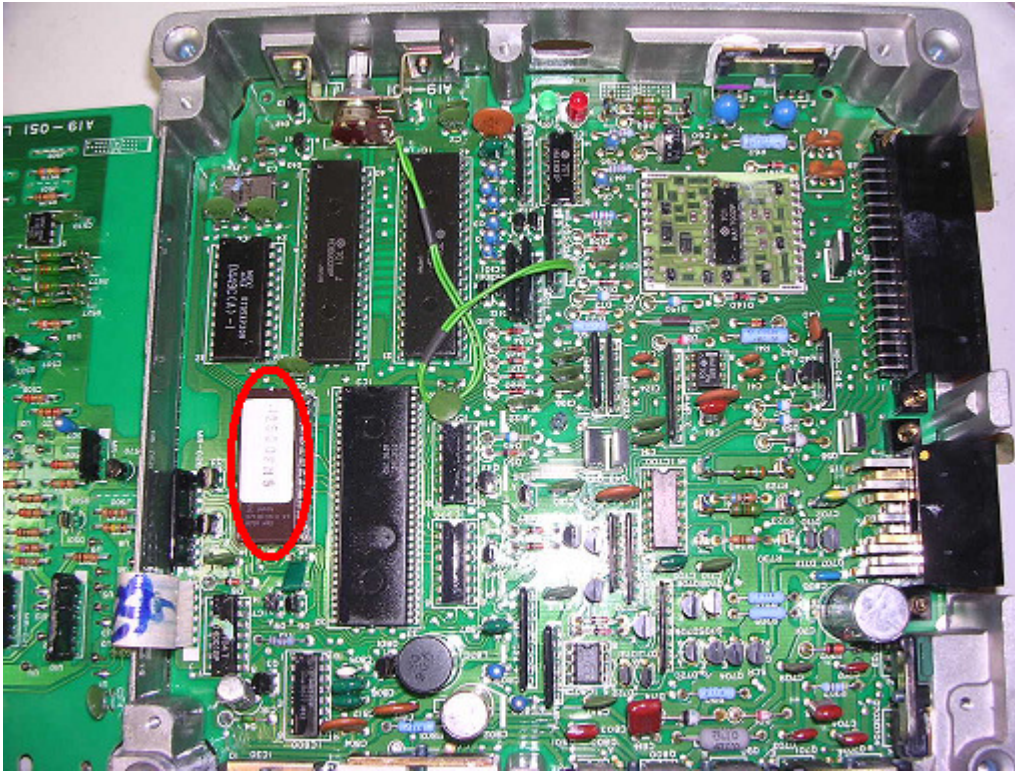
4. Verify ECU operation with new socket using only the factory 28 pin ROM chip. The LEDs should flash when in diagnostic mode, and vehicle should function as normal. If not then immediately remove power and recheck your soldering

Installation of the NISTune board now follows the same procedure as for other 6802 based ECUs.

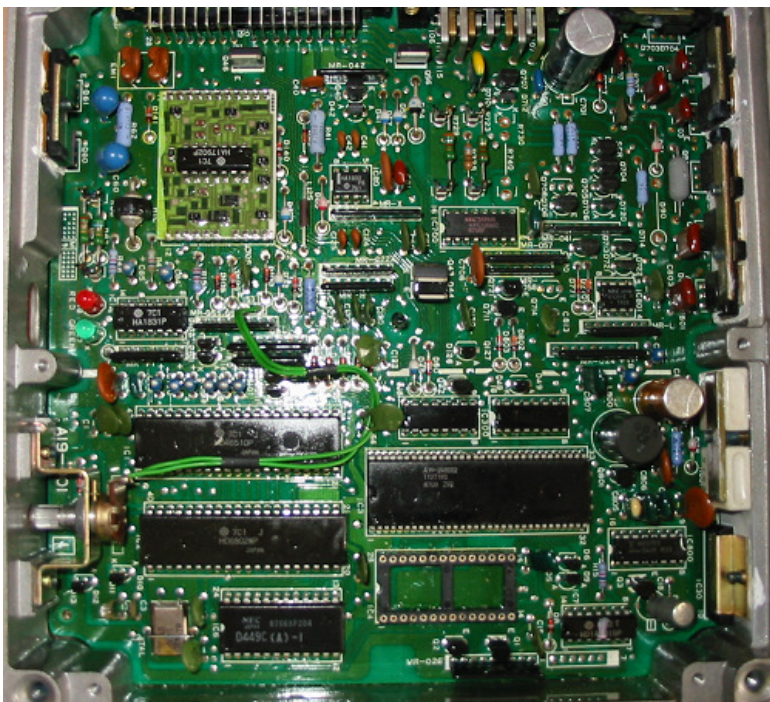
C. 1987 Single Board - Single ROM ECUs

Vehicles: Z31 300ZX VG30 1987, VL RB30

These ECUs only contain a single chip such as pictured below one 28 pin ROM chip



1. Remove the factory ROM chip, install a 28 pin machine drilled socket



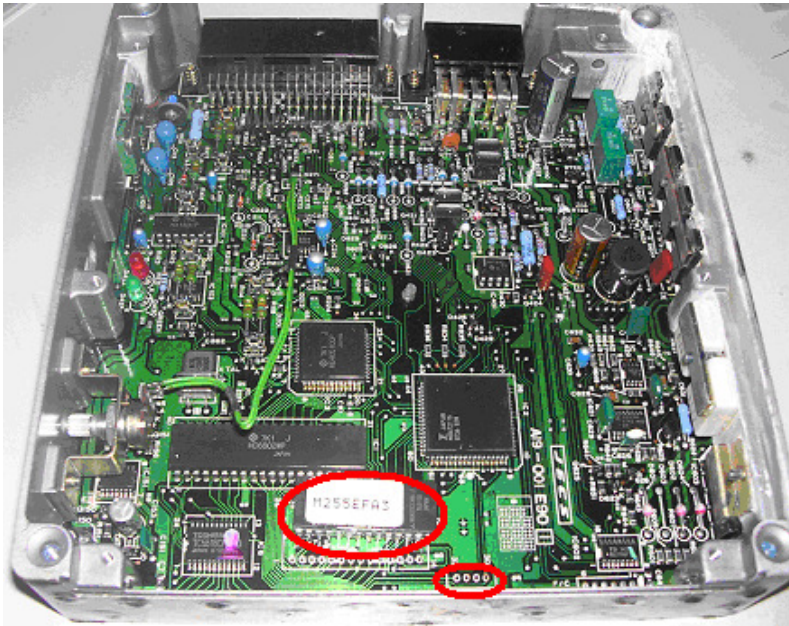
2. Then test that the ECU still works by placing the factory ROM chip in the socket and checking the vehicle runs and flashes LEDs when in diagnostic mode.

Installation of the NISTune board now follows the same procedure as for other 6802 based ECUs.

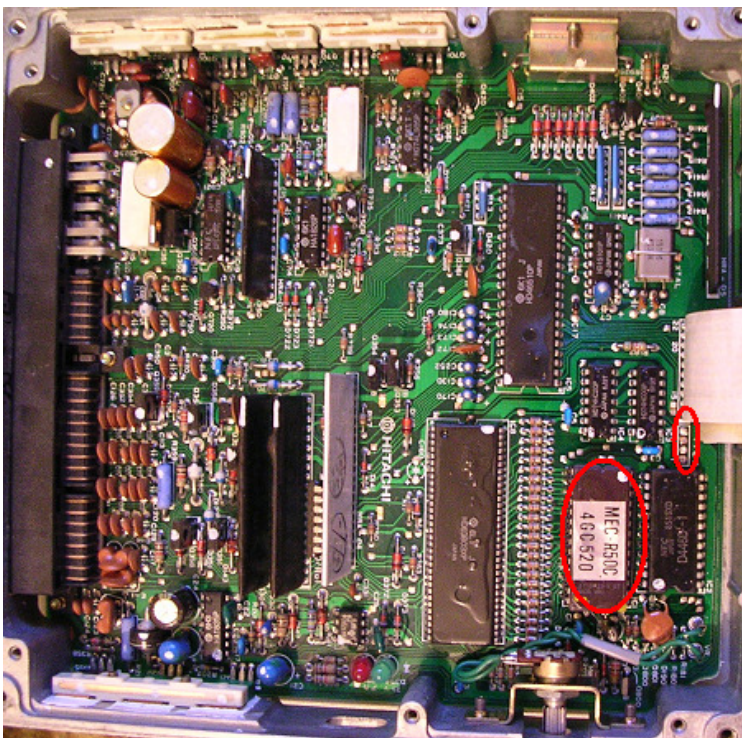
D. 1989 Single Board - Single ROM - Header Connector ECUs

Vehicles: Z31 VG30 late, HR31 RB20, S13 CA18, A31 RB20, EK10 MA09, S13 KA24E

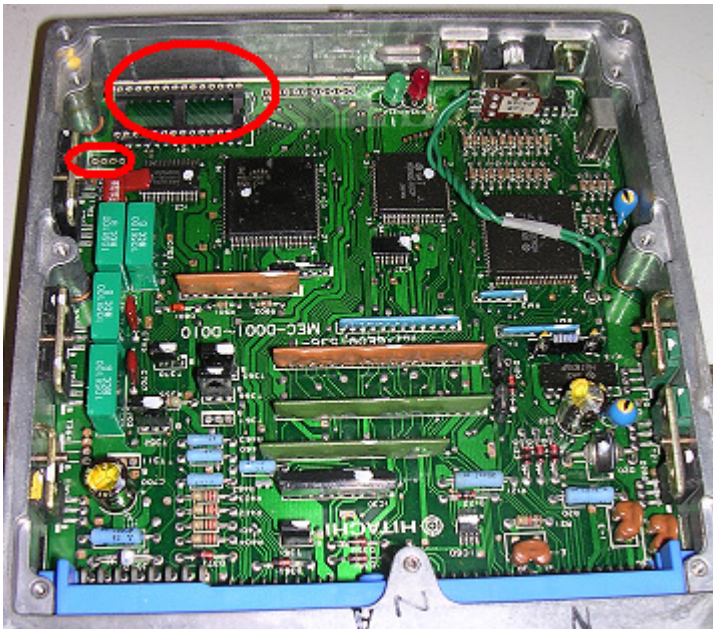
These ECUs either only contain a single chip such as shown in the pictures below. These contain a header connector which the NISTune board connects to on this particular ECU.



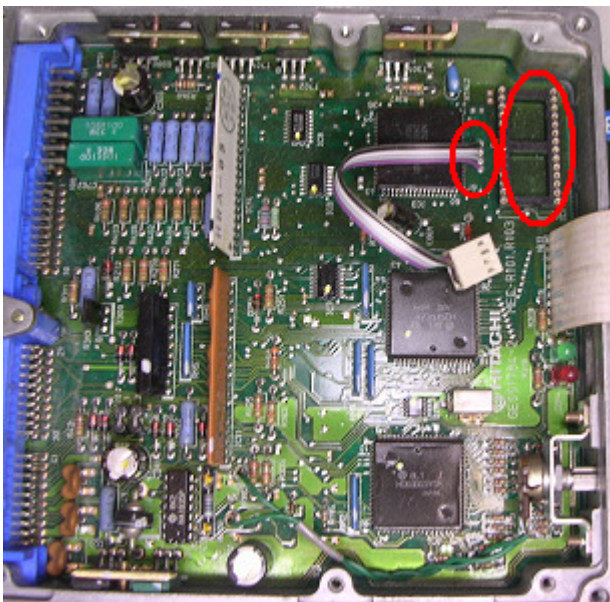
1989 Z31 VG30E/ET



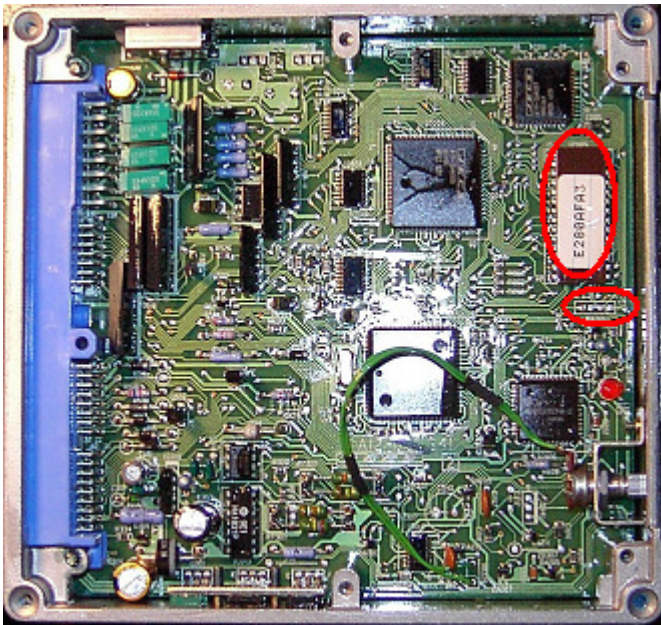
HR31 RB20DET



S13 CA18DE/DET



A31 RB20DE/DET



EK10 MA09ERT / S13 KA24E

1. Remove the factory ROM chip, install a 28 pin machine drilled socket
2. Then test that the ECU still works by placing the factory ROM chip in the socket and checking the vehicle runs and flashes LEDs when in diagnostic mode.

Installation of the NIStune board now follows the same procedure as for other 6802 based ECUs apart from the header connector.

4. CPU Header Connector Installation (X1)

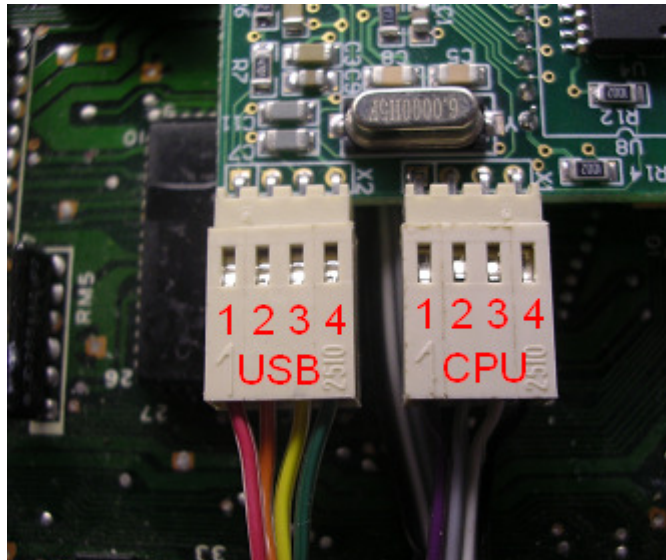
The NIStune board will come supplied with two header connectors. One is for the USB socket and the other connects to the ECU processor (marked HD6802 or HD6303)

Early model ECUs will require direct connection to the processor, whilst later model ECUs provide a silkscreen connector socket which needs to be soldered to.

The CPU header connector plugs into connector **X1** on your Type 1 NIStune board and has a marking on the connector to signify which pin is pin 1.

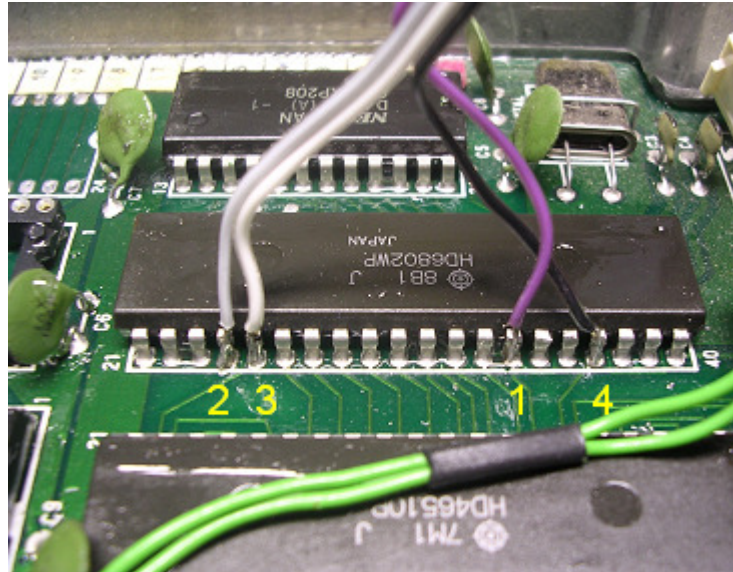
Important note: Due to recent changes in manufacture, colour coded wires will no longer be used on Type 1 boards. The pin 1 will be identified by a marking on the connector itself as well as the end of the wire.

- 1 - (R/W)
- 2 - (A14)
- 3 - (A15)
- 4 - (E)



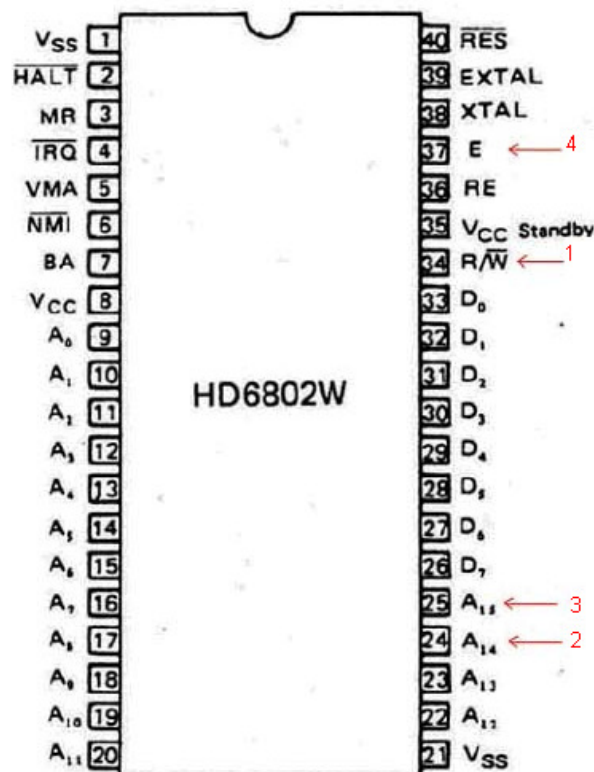
A. Early Model ECUs

You need to solder the following wires to the HD6802 processor similar to the picture below.



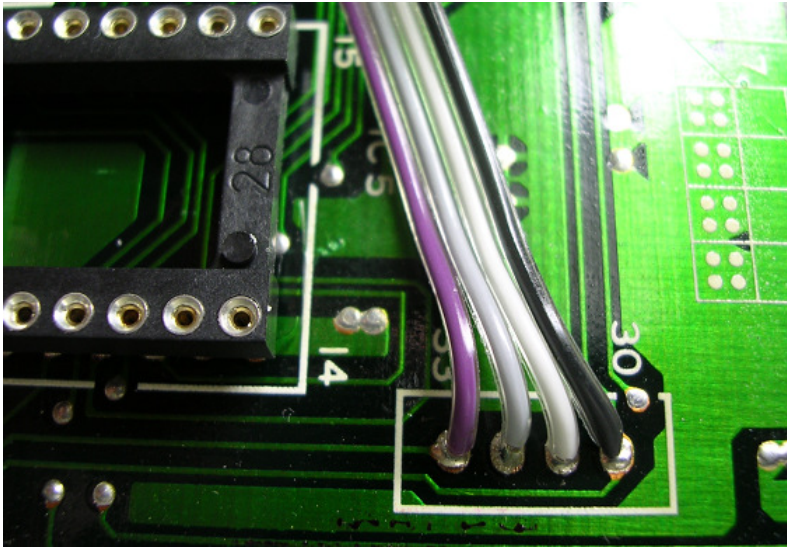
The header connector you are supplied with is marked with a '1' on the left hand side.

This corresponds to the 1 on the diagram below. Solder the ends of the wires to the CPU pins below, ensuring that there is no possibility of the wire shorting to a neighbouring pin. Hot glue over the wiring connections afterwards to ensure they do not move. Any short circuit will stop the ECU from working and may damage it.



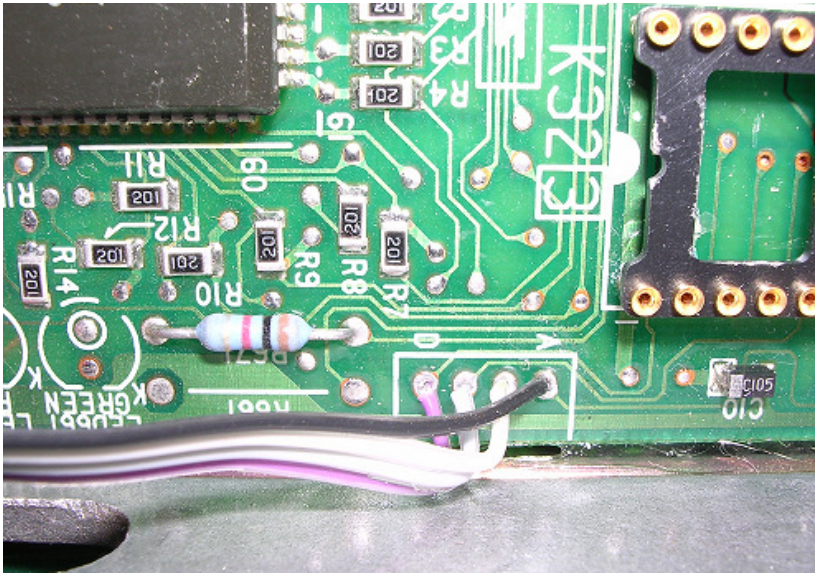
B. Later Model ECUs

Later model ECUs connect directly to the circuit board using through holes provided by Nissan. Locate the header connector through holes and silkscreen and solder directly to this.



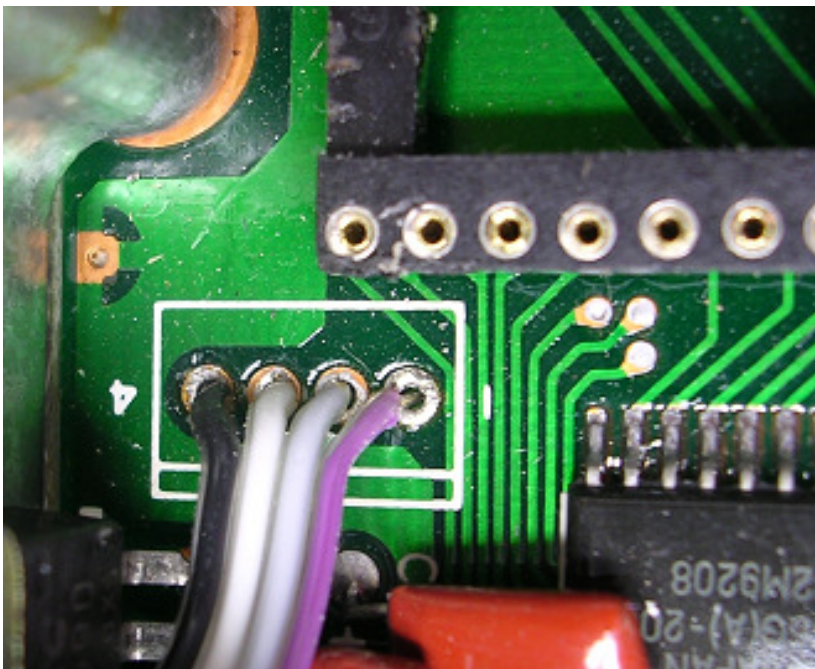
1989 Z31 300ZX

- Connector Wire 1 - ECU throughhole #33
- Connector Wire 2 - ECU throughhole #32
- Connector Wire 3 - ECU throughhole #31
- Connector Wire 4 - ECU throughhole #30



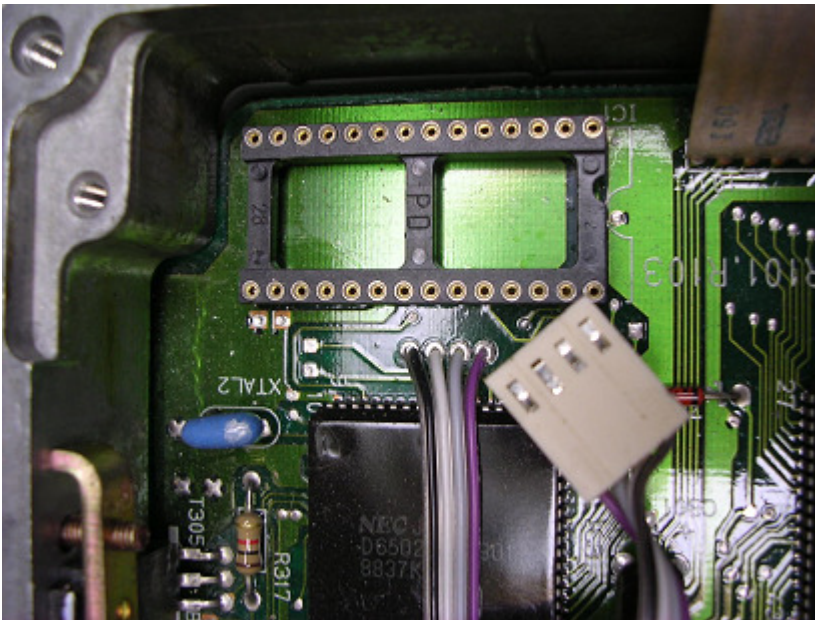
J30 Maxima

Connector Wire 1 - ECU throughhole D
 Connector Wire 2 - ECU throughhole C
 Connector Wire 3 - ECU throughhole B
 Connector Wire 4 - ECU throughhole A



S13 CA18 / S13 KA24E

Connector Wire 1 - ECU throughhole #1
 Connector Wire 2 - ECU throughhole #2
 Connector Wire 3 - ECU throughhole #3
 Connector Wire 4 - ECU throughhole #4



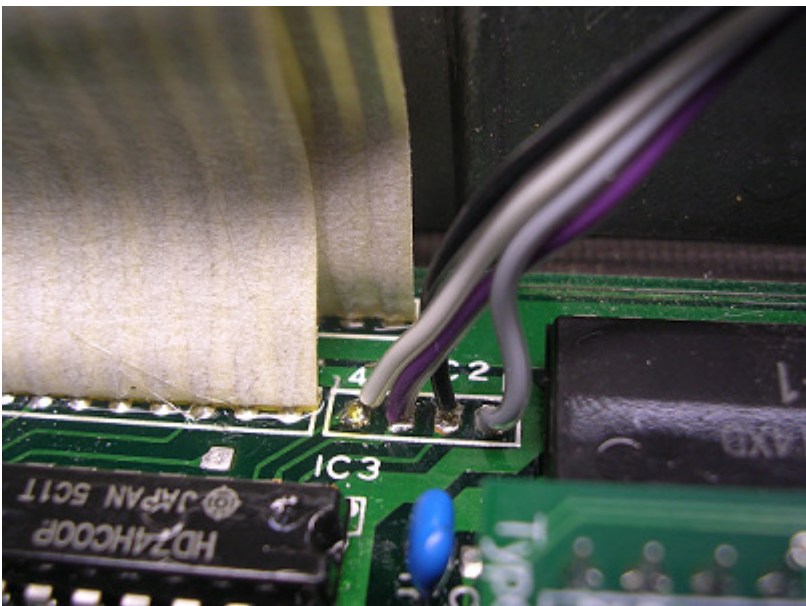
A31 RB20

Connector Wire 1 - ECU throughhole near 61

Connector Wire 2 - ECU throughhole

Connector Wire 3 - ECU throughhole

Connector Wire 4 - ECU throughhole near 9



HR31 RB20

Early:

Connector Wire 1 - ECU throughhole 3

Connector Wire 2 - ECU throughhole 1

Connector Wire 3 - ECU throughhole 4

Connector Wire 4 - ECU throughhole 2

Late:

Connector Wire 1 - ECU throughhole 1

Connector Wire 2 - ECU throughhole 2

Connector Wire 3 - ECU throughhole 3

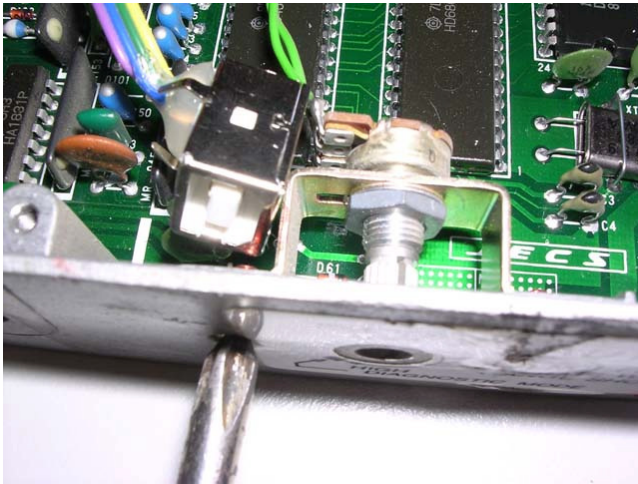
Connector Wire 4 - ECU throughhole 4

5. USB Connector Installation (X2)

The USB-B style connector that comes with the NISTune board is recommended for install where the diagnostic potentiometer normally sits. It is up to the owner where they wish to locate this port.

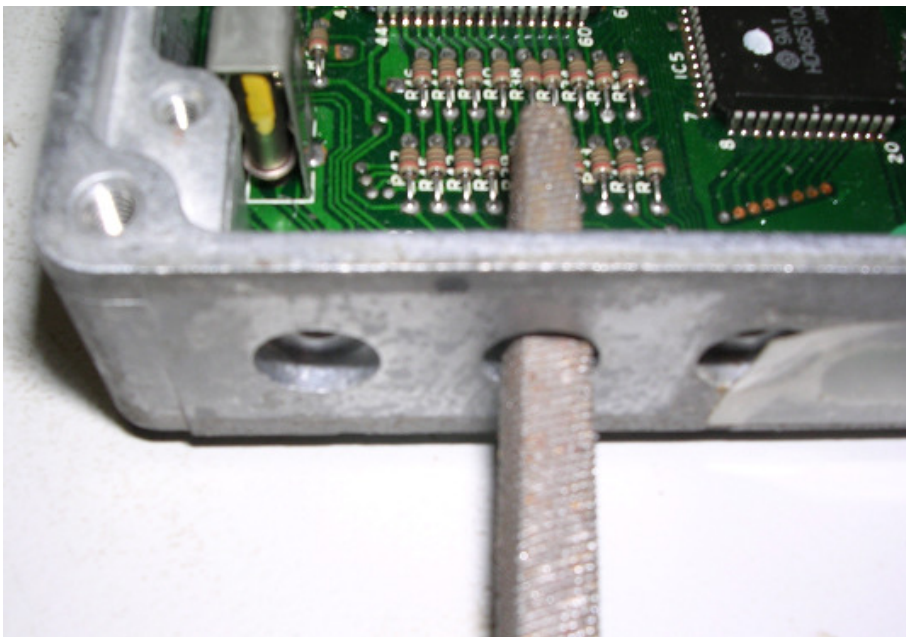
The existing bracket from the diagnostic potentiometer fits the USB connector, but requires the hole to be drilled and filed out to fit the connector plug through. The potentiometer is normally used for idle fine select and diagnostic indicator. The diagnostics can be retrieved from NISTune software, so this is no longer required. The diagnostics selector will be replaced by the USB socket

1. Firstly remove the screws under the ECU warning socket connecting the diagnostics selector bracket.



Unscrew the potentiometer from the bracket, and either cut or desolder the wires to the potentiometer from the ECU. Ensure that if the wires are cut, that the exposed ends are adequately insulated.

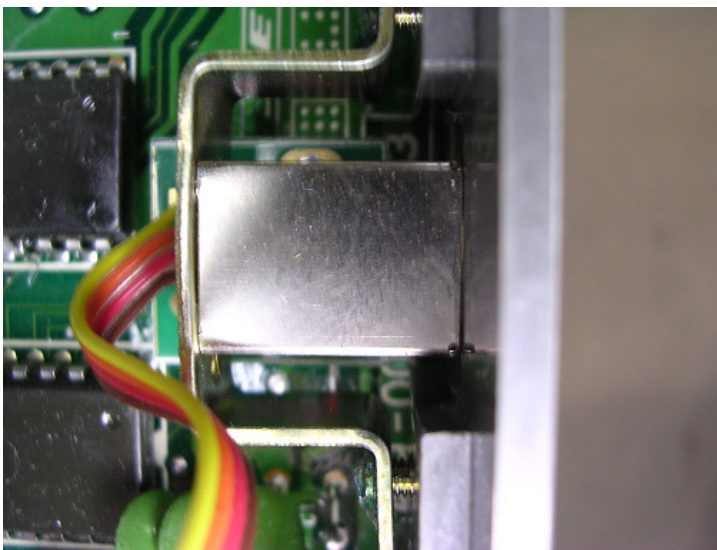
Using a drill size slightly larger than the hole that contained the diagnostics selector, enlarge this hole. This must be of sufficient size that the USB-B type connector cable can fit through the hole to the socket in the ECU.



Ensure that all ECU housing debris caused by the drilling is blown away from the ECU circuitry afterwards. **Any debris that is remaining may cause short circuit to ECU components.**



Then put the USB-B socket inside the bracket and refasten the bracket as seen below.



If your ECU has no daughter board then the USB connector board may face upwards. If you are using a daughter board then ensure that the USB adaptor board faces downwards and does not touch any other components.

Notes:

A31 RB20/ S13 CA18: It may be necessary to use longer screws to hold the original potentiometer bracket.

U13 KA24E/EK10 MA09: The bracket has a single screw. You will need to fabricate a custom bracket using two screw holes to hold the USB adaptor

HR31 RB20: We have found that there is no room for the USB connector. You may have to relocate this bracket by drilling and tapping new holes in a different location if you wish to have this fitted permanently

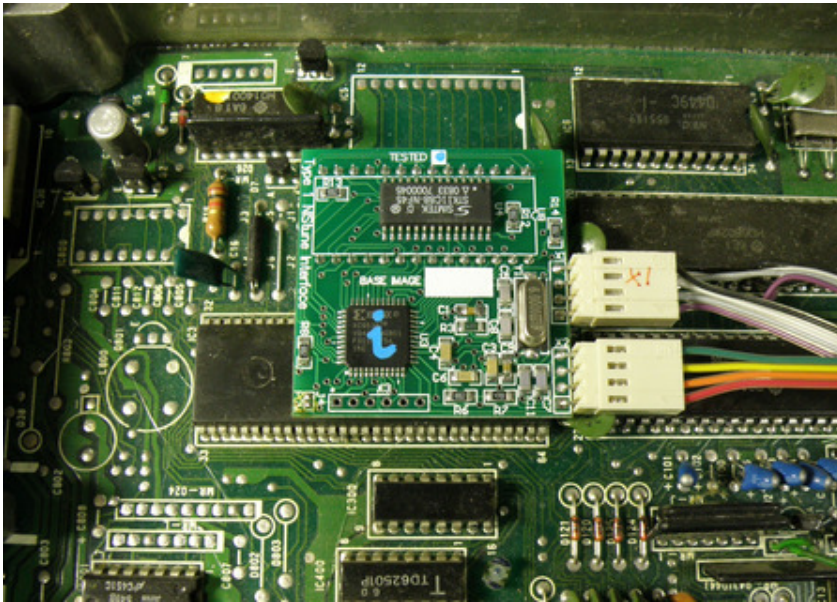
Ensure your USB socket is installed correctly and pressed against the ECU casing. This provides a ground contact point for the USB shield to the board, to absorb electrical noise and prevent unwanted USB disconnects during operation.

6. Inserting The Board

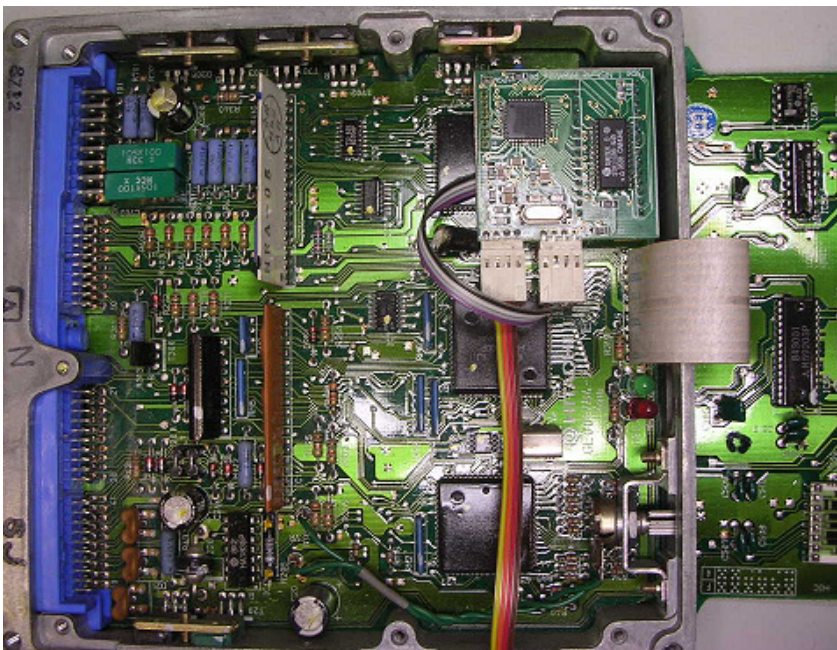
Push the NISTune board into the machine drilled socket previously installed. Connect the CPU cable to connector X1 and the USB cable to connector X2.

Ensure the PGM jumper is **not** soldered if the board was previously programmed.

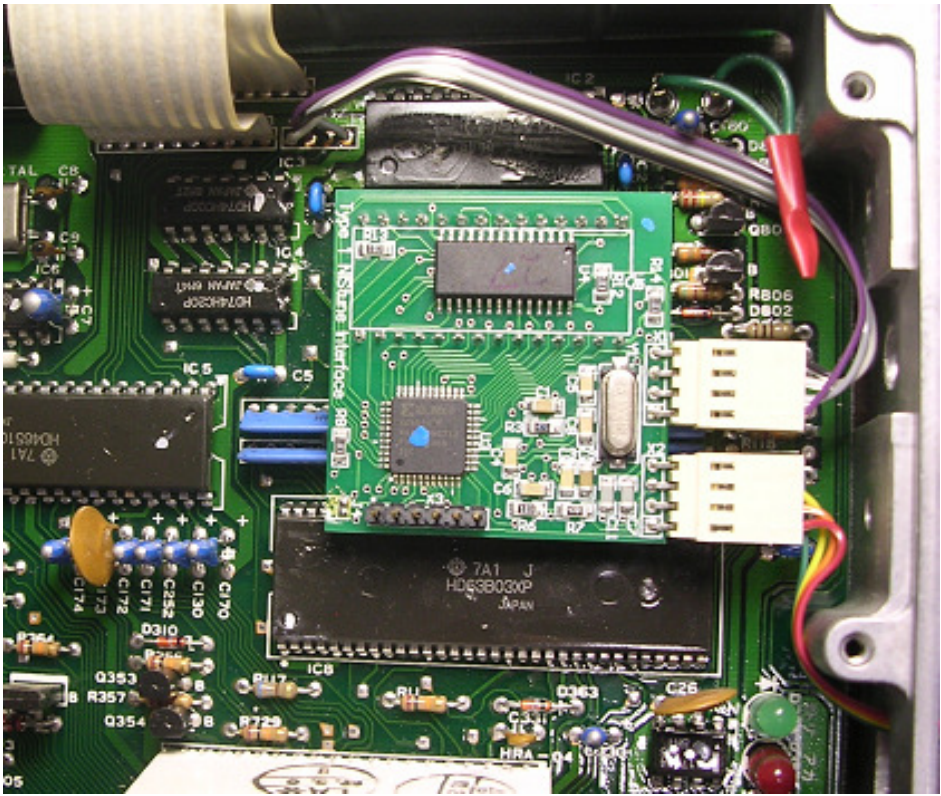
Where there is a knock sensor board, being wary of the knock sensor cable. If the JTAG programming pins pointing upwards appear to touch components of the knock sensor board, these can be trimmed back with wire cutters, as these are only used during factory programming.



R31/Z31/VLT Installation



S13 CA18/M30 VG30/A31 RB30/S13 KA24E Installation



HR31 HR20 Installation

7. Securing The Board

It is the responsibility of the installer to ensure that the vibration that the ECU is subjected to with the installed NIS tune board (ie unsurfaced roads, train lines, speed humps, grates etc) will not affect the operation of the vehicle.

The NIS tune board must be installed using machine drill pin sockets which ensure a firm connection to the ECU. However the board itself must also be secured to the ECU through suitable means (such as hot glue) to surrounding components.

Also be aware that surrounding components are sprayed with conformal coating. This coating may lift during vehicle operation and hot glue may become separated from components. Ensure that either conformal coating is removed where hot glue is adhered to, or sufficient coverage of circuit board components is made such that vibration will not affect the adhering of hot glue.

WARNING: If removable jumpers are not secured correctly and temporarily or permanently become disconnected, ECU will not function. Note that the four pin header must be also secured using hot glue or similar method.

8. Installing In The Vehicle

Put the ECU casing back together and reinstall ECU into the metal bracket. The diagnostic indicator now containing the USB-B port should be accessible as seen below.



Reinstall ECU into vehicle. You may need to enlargen kick panel diagnostics hole for correct line up of the USB-B connector to the ECU. Use a drill to enlargen the hole.

Connect the USB cable to the ECU through this port and other end to the laptop. Turn the vehicle Ignition switch to 'ON' without starting the car

Your fuel pump should operate as normal and the car should be able to start. If not then immediately turn off the engine and attempt to diagnose the problem following the NISTune diagnostics document.

If your ECU pulses the fuel pump, injectors, fuel regulator, flashes LEDs randomly (or they just stay on) or does not start then your ECU could be reading a corrupt ROM image. Testing has shown that a corrupt ECU can keep the heater element on longer than 1 second and blow it like a fuse. Ensure a corrupted image in your ECU is rectified immediately and is powered off if corruption is suspected to avoid this situation possibly occurring to you.

Following NISTune USB device installation, configuration and connection, pressing the 'USB Consult' button should highlight in red, and viewing the 'Consult Display' should show the battery, temperature and AFM voltages.



Turn the vehicle Ignition switch to 'START' briefly to run the engine. Whilst the engine is running the 'Consult Display' should indicate more parameters and maptracing should be available in the various graphic windows available from the NISTune software.

Refer to the NISTune Software Operators Manual and Type 1 QuickStart Manual for more information regarding the installation of USB drivers and usage of the NISTune software.

Refer to the NISTune Diagnostics Manual if you have problems connecting to the NISTune board.

9. Upgrading ECU MAF hardware

Early model engine control units such as Z31, R31, most HR31 (1985-1988) and VL Turbo use a 2 -7 volt hotwire airflow meter. These air flow meters then have their voltage converted to 0 - 5 volts for the internal microprocessor using what is known as 'opamp' circuitry.

The later model ECUs and airflow meters all work on 0 - 5 volt circuitry.

When installing a later model mass airflow meter from a later model vehicle to one of these earlier model vehicles, it is necessary to modify the ECU hardware to handle the difference in air flow meter voltage.

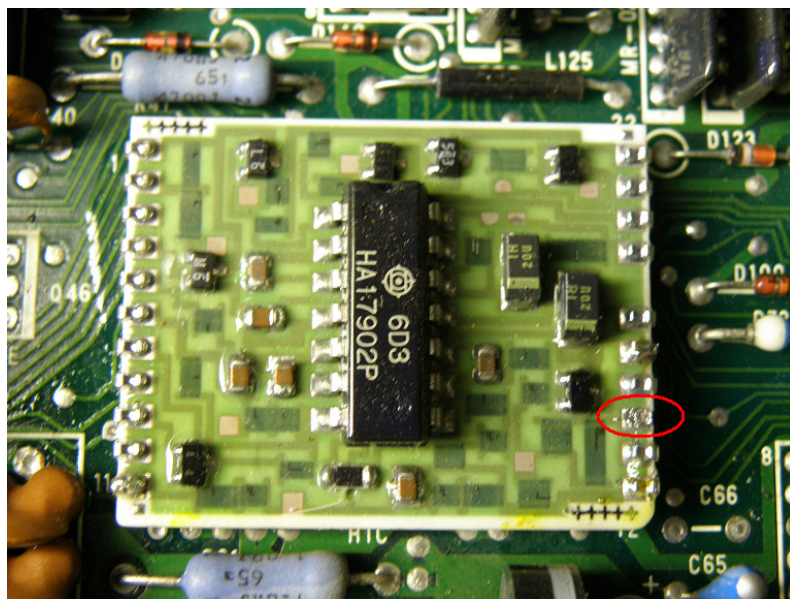
This is done by either altering or removing the circuitry path via the opamp, and then limiting the maximum voltage using a zener diode. These instructions details the steps to take when modifying the ECU

Further instructions regarding MAF pinouts are available in the Software Users Manual.

1984-1986 CR31/Z31/VLT

1. Locate the op amp surface mount board in your ECU as pictured below
2. Remove pin 14 on RHS of mini board

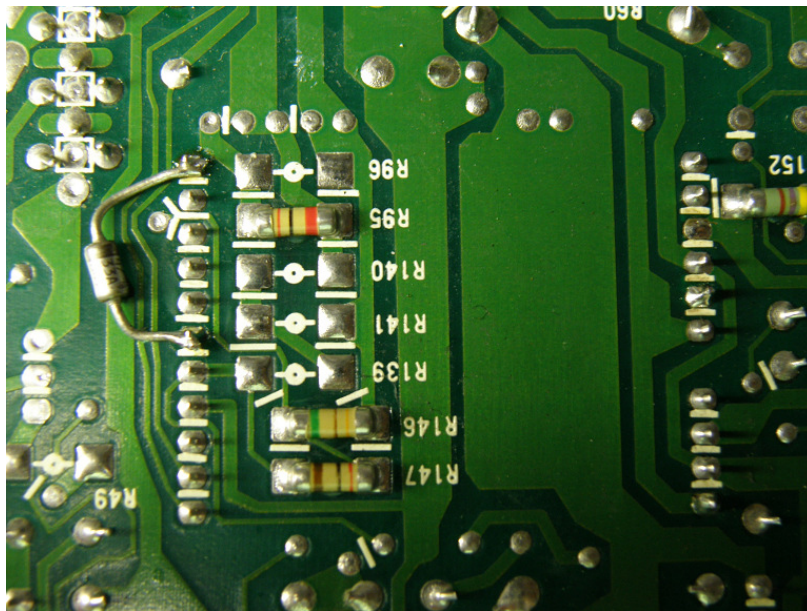
Do this by applying heat to the top of the connector and then pushing away from the mini board with a flat blade screw driver. Then using tweezers to hold the connectors, heat the opposite side of the circuit board to remove the connector completely.



5. Install the Zener diode to the reverse side of the ECU. Zener diode is available from us or from Altronics (Australia) or Dick Smith (Australia) as well as other electronics components shops worldwide:
<http://www.altronics.com.au/index.asp?area=item&id=Z0314>



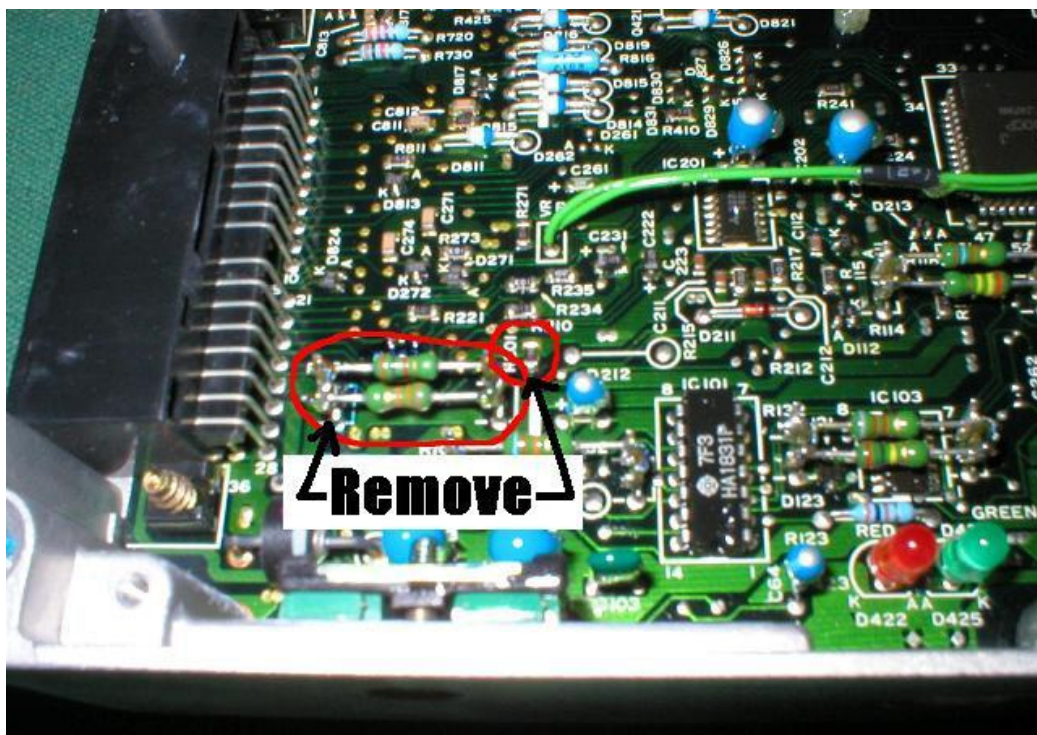
Pictured below with banded end of the zener diode facing the installed AFM signal jumper wire. The other end is connected to the ground pin of the mini board. This will limit the voltage from the AFM to 5.1 volts



6. Rewire the AFM as per pinouts in the AFM section of the Nistune Software Users Manual

1987 - 1989 Z31

1. Disconnect parallel resistors pictured below and remove resistor R201

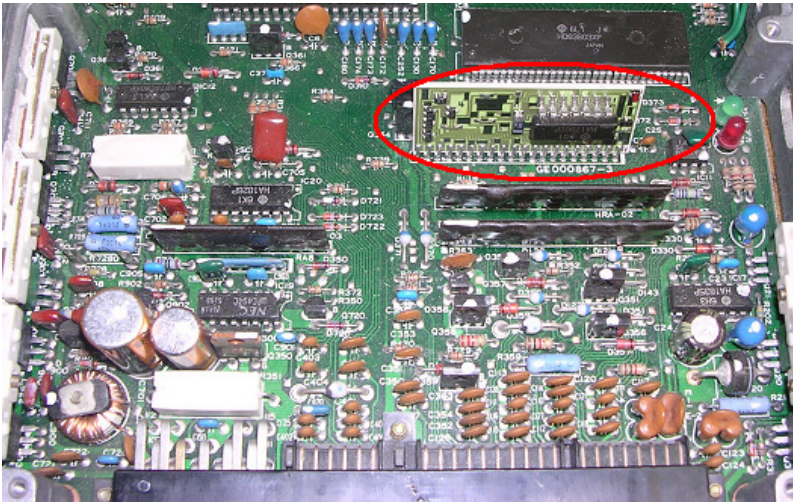


2. Rewire the AFM as per pinouts in the AFM section of the Nistune Software Users Manual

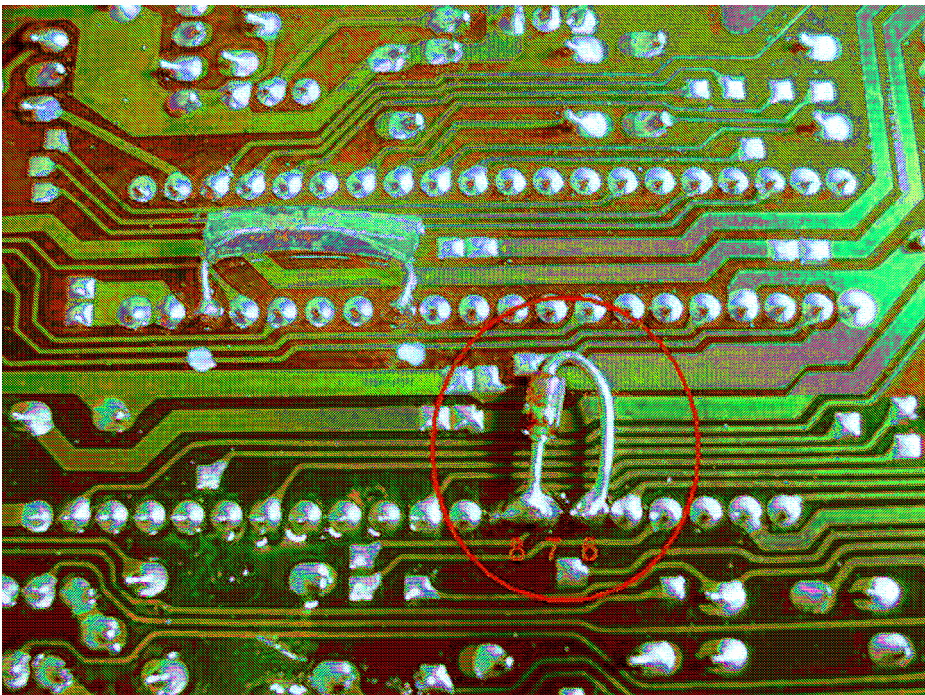
1986-1988 HR31 RB20DET

Note the later year models (such as MEC-R70 do not require this modification)

1. Locate opamp daughter board



2. On reverse side of ECU count from the outside edge inwards and bridge pins 7 and 8 with solder.
3. Connect a 5.1 volt zener diode with stripe side on pin 8 and other end on pin 6 (ground) as pictured below



4. Rewire the AFM as per pinouts in the AFM section of the Nistune Software Users Manual

10. Reading the factory ROM image

ECU Type A (1984-1985)

These ECUs have two non-standard ROM chips (1K and 8K) which require special adaptors to read them in a standard EPROM programmer. It is recommended you send the ECU to NISTune developments for reading and board installation. *We plan to make adaptors available in the future.*

ECU Type B (1986)

These ECUs have a standard 27C128 (16K) compatible ROM and non-standard MB7132 (1K) ROM chip.

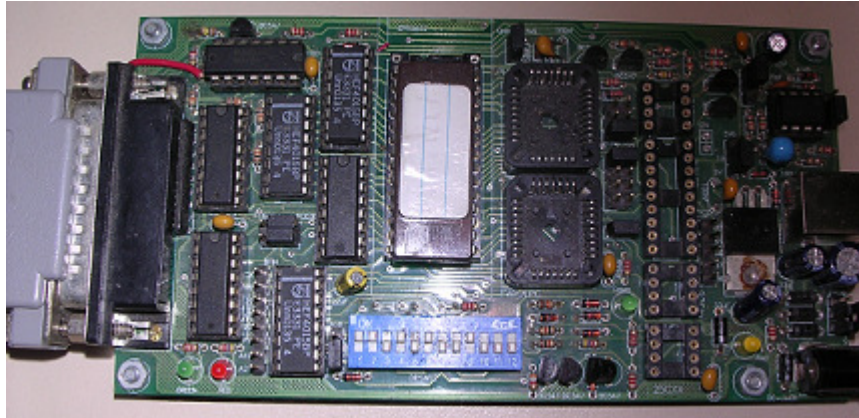
The second smaller chip requires a special adaptor for reading. It is recommended you send the ECU to NISTune developments for reading. *However we may already have the ROM image for most of these type of ECUs here, so please check with us.*

ECU Types C, D

These ECUs have a standard 27C128/27C256 EPROM chip. After removing the EPROM chip from your ECU, you may need to read these using an EPROM programmer. You need to either read them as a 27C128 or a 27C256 chip.

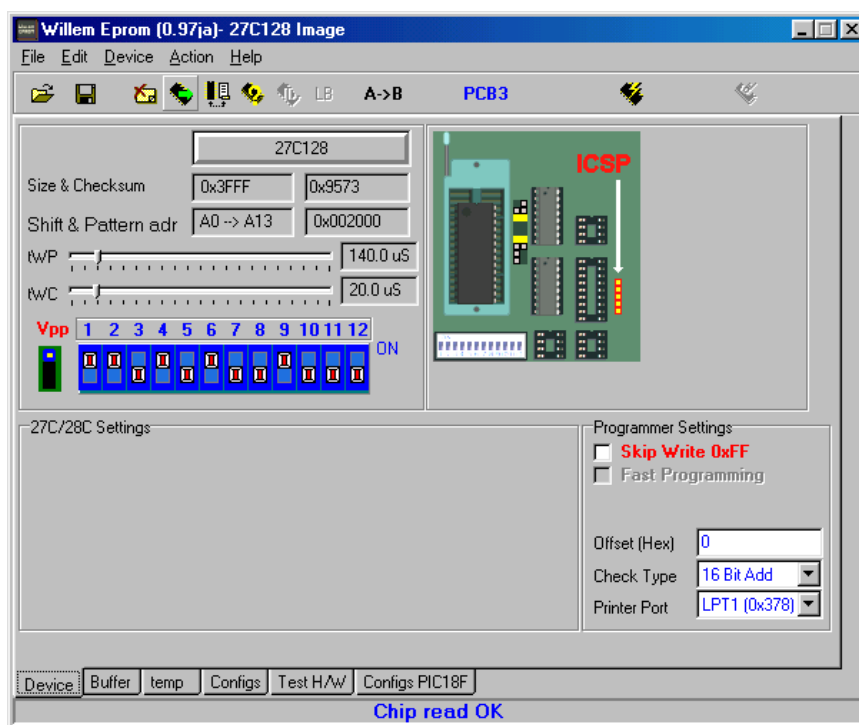
Programmer Information

There are many different types of EPROM programmers available. One of the common programmers is the Willem as pictured below.

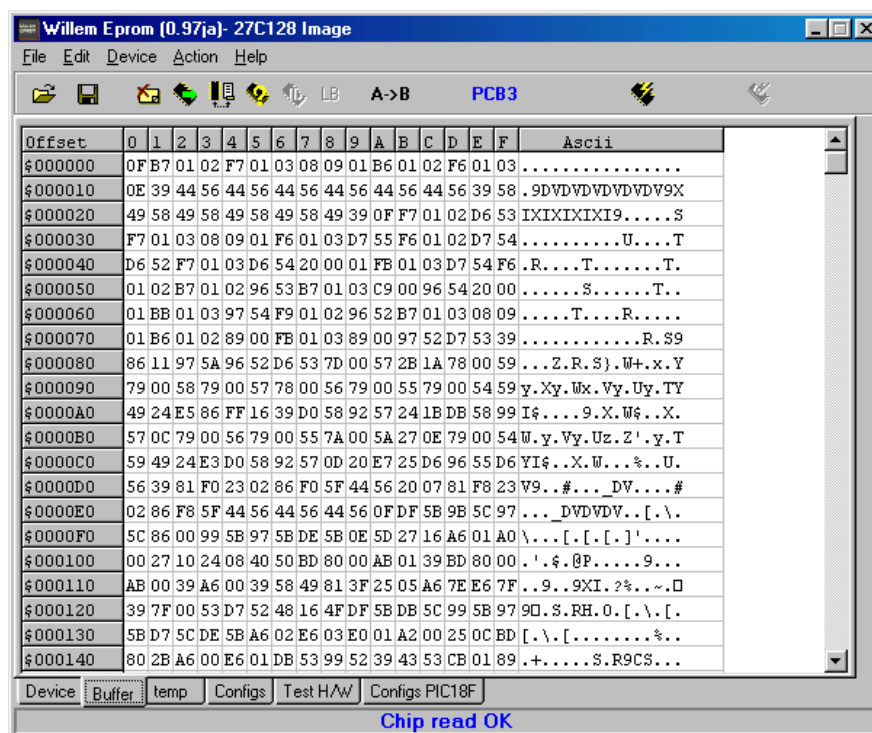


The software for your programmer will allow you to select the chip type you wish to read and load it into memory, and then save it as a file afterwards. *Note: For the Willem programmer, ensure you have the switch settings as specified in the software*

1. So ensure you select the correct chip type matching your ROM/EPROM chip. Then select the read option which will load the contents from the chip into memory.



2. Then check the EPROM contents using a hex editor to ensure you read it correctly. Should have data such as below.



3. Then save the file and send to NISTune Developments. A descriptive file name such as the following will help us catalogue your ROM image. The Nissan part# starts with 23710-XXXXX and is sometimes stamped on the ECU casing

<CAR MODEL><ENGINE><NISSAN PART#><YEAR><TYPE><DESCRIPTION>

Z31_VG30ET_J7120_1989_MAN_UDM.bin

REVISION HISTORY

DATE	VERSION	DESCRIPTION
21/12/2005	1.0	Document Creation
24/01/2006	1.0.1	Correct HD6802 wiring to X3 header connection
11/6/2006	1.1	Pictures include Rev 2 board Cover different Z31 variants Add HR31/CA18 ECU installation documentation
18/7/2006	1.1.1	Explain corruption issues Fix Z31 1984 part of document
25/2/2007	2.0	Type 1 - Rev3A boards new document
15/3/2007	2.1	Update per user feedback. Update some pictures
13/4/2007	2.2	Corrected 1989 Z31 pinouts
17/3/2008	2.3	Updated pictures and reformatting
24/3/2009	3.0	Moved MAF information here, updated colours
14/7/2009	3.1	Updating MAF section to fix errors
25/9/2009	3.2	Updating MAF for new opamp procedure